





## PALM OASES

ERNESTO FRANCO • HORACIO DE LA CUEVA

An oasis is a fertile spot in the desert, due to the presence of water. It is almost impossible to conjure up a mental image of an oasis without associating it with the palm tree, the philosopher's stone of an oasis. Its roots cling to the rocks and eventually decompose them, producing the soil in which many other plants can grow. Its flowers and fruit are food for birds, bats, insects, and humans. The great number of dry leaves, still attached to the trunk, shelter small animals and produce the soft rustling so characteristic of an oasis.

In the southernmost part of the Sierra de San Pedro Mártir, there is a spectacular area of unexplored canyons and mesetas where some 150 oases with stands of the blue fan palm, an elegant tree native to Baja California, are to be found. The region displays strong contrasts in types of vegetation: the scrub and tree forests of the Floristic Province of California end and the scrub forests of the peninsular deserts begin. Here, we find oases surrounded by chaparral with pinyon pine and juniper forests. A few kilometers south and at lower elevations, the blue-fan-palm oases are surrounded by tall columnar cactuses and boojum trees, typical of the Baja California central desert.

The greenish and bluish-gray color of the blue palm makes it easy to distinguish from the other two native palms of the Baja California Peninsula, the California fan palm and the Mexican or Baja California fan palm, both with deep green leaves. The former grows in desert canyons in southern California to the Bahía de los Ángeles. The latter can be found in similar sites in the states of Baja California and Sonora. On the other hand, the blue fan palm is found from San Ignacio and some islands of the Gulf of California to the Sierra de Juárez.

Geological maps, as well as our field observations, indicate that with few exceptions these oases are found in granitic rocks bearing some relation to geological faults. There are often springs associated with such faults, giving rise to wetlands with rush vegetation cover rooted in a green mud composed of fine particles, resulting from the friction between rocks. All the oases of the Sierra de San Pedro Mártir have pure stands of blue palm, but in the Sierra de Juárez sometimes they are mixed

with stands of the California fan palm. Further south, the three species often grow side by side, as for instance in Cataviña and other places in the central desert.

Generally, the oases of Baja California are situated in the desert areas on the eastern side of the cordillera ranges of the peninsula. In contrast, blue-palm oases occur around the southern tip of San Pedro Mártir. Yet the blue palm is absent in a vast area of steep slopes northeast of this range.

The tropical storm Nora, which swept through the region in September of 1997, taught us quite a lesson. Possibly the distribution of palm vegetation in oases and canyons is linked to the flow of organic debris, which follow the paths of streams originating when these cyclones discharge their rains. In the written history of the peninsula, Nora was the only storm to reach the 30th parallel with hurricane force. Soon after it had passed, we visited several sites where, as indicated on aerial photographs taken earlier, oases with blue palms had been established. Some of the largest ones had been wiped out, in some cases without leaving any trace, and in others, leaving some young palm trees, tilted sideways by the gale force, and covered with debris.

In the bed of the Matomí arroyo, on the southeastern flank of the Sierra de San Pedro Mártir, the currents had washed away all vegetation, but older palms were still intact at a respectable distance from the course the currents had taken. The arroyo had carried off all the soil; with their roots exposed, it is likely that these palms have not survived.

Age and distribution of the oases are determined by the speed and quantity of debris flowing in the arroyos during tropical storms. North of Agua Caliente in the Sierra de San Pedro Mártir, there are no palm oases. In the lower parts south of the mountains, some oases disappeared, but it is likely that tropical storms invade this region with a frequency similar to the life cycle of the palm trees (a few hundred years). The hurricanes simply start a process of renewal in the succession of vegetation. Based on aerial flights, we were able to confirm that the vast majority of oases in this region withstood Hurricane Nora.

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PHOTOGRAPHS - left: *Cardons and blue fan palms in the central desert of Baja California (JD)*; following pages: *Blue fan palms in the Cañada Berrendo, Sierra de San Pedro Mártir (BE)*.













Blue-palm oases play an important role in sustaining this region's biotic diversity. For one, they are wetlands where a variety of aquatic animals can exist. And they serve as areas where local and migratory bird species can rest and find their food and water, and as areas where native mammal species can find refuge. Blue-palm oases will probably continue to be the key sites for survival of desert bighorn sheep and places where the puma will continue hunting it as well. Thus, the California condor, soon to be reintroduced into its former Baja California habitats, will also search for its food there.

In this marvelous region of ecological transition, we can find many oases with a wealth of plant species, pertaining to regions of coastal scrub vegetation, chaparral, conifer forest or desert vegetation. In one oasis on the southwestern flank of San Pedro Mártir, we recorded 57 plant species belonging to 26 families. Apart from the blue palm, there were two species of pinyon pine, alamillo juniper, and quaking aspen, together with a diversified lower vegetation cover including lila, saltbush, Mexican manzanita, California holly, two species of desert apricot, coffeeberry, laurel sumac, and four oak species. And there were many desert plants like biznaga, maguey (agave), two species of yucca, strawberry cactus, and chollas. We noted two species of frogs, rabbits and kangaroo rats, as well as footprints or other indications of the presence of pumas, coyotes, and raccoons. We also spotted woodpeckers, jackdaws, quails, three species of sparrow hawk, black phoebes (flycatchers), ruby-crowned kinglets, gray vireos, white- and golden-crowned and black-throated sparrows, and a black or turkey vulture.

A virtually unknown aspect of the oasis is its fire ecology. Few palms do not display some kind of burn

marks, although they are practically immune to fires. Accumulation of dry leaves, which will easily catch fire, is an indication that adaptation to fire hazards is not just resistance to fire; rather, the palm contributes fuel, ensuring its predominance by eliminating competitors for light and space, besides fertilizing the soil with ashes from its leaves and from nearby plants.

Except for cattle grazing, ever since the first contacts with the Europeans, there has not been a significant human impact of any other kind on the oasis system, perhaps because most of them are far away from human settlements. However, the disturbances brought about by cattle seem to be fairly serious. The animals trample the banks of the streams, break the riparian vegetation cover, and leave their droppings in the water; that lowers water quality and also raises its temperature, thereby reducing the biological carrying capacity of the habitats. With grazing, exotic species are introduced and often these end up proliferating due to the lack of native predators. One of our research objectives is to find a few of the remaining oases that have not been exposed to cattle-grazing, in order to make a comparison with destroyed oases or with those that withstood the impact of Hurricane Nora. Some undisturbed oases in this region may well harbor unknown species, mainly plants and invertebrates.

The chain of oases allowed Indians as well as missionaries to travel through a terrain otherwise very difficult to cross. After walking through a dry and harsh landscape, it is very pleasant to hear the rustling of palm leaves in the breeze, together with singing birds and the tinkling of water falling between big pools or splashing on granitic rocks. Blue-palm oases are among the rare sites where we can still contemplate Baja California as our ancestors once knew it.

PHOTOGRAPHS - above: A *Xantus' hummingbird* at the bottom of a ravine in the Sierra de San Francisco (PRG); right: Palms in the San Pablo stream in the Sierra de San Francisco (PRG).







# THE GULF OF CALIFORNIA

A WORLD APART

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